

## REMARKS

In view of the above amendments and the following remarks, reconsideration and further examination are respectfully requested. A terminal disclaimer is being filed with this response.

1) Claims 18-19, 21, 25, and 27-35 were rejected under 35 U.S.C. §103(a) as being unpatentable over US Patent Publication No. 2003/0092560 by von Blucher in view of US Patent No. 4,273,619 by Angelo II.

### Teaching of von Blucher

US 2003/0092560 A1 (von Blucher et al.), which corresponds to document US 7 288 504 B2, teaches a method for producing spherical activated carbon starting with organic polymer spherules containing chemical groups leading to the formation of free radicals and thus to cross-linkages by their thermal decomposition (see abstract). At paragraphs 0046-0048, von Blucher teaches:

...The solution according to the present invention is to carry out precarbonization, which is substantially completed at approx. 600°C, on a continuous basis such that a uniform output of SO<sub>2</sub> (and of some volatile hydrocarbons) takes place while the activation is performed in a discontinuous manner.

[0047] The advantages of separating the acidic phase (pre-carbonization) from the high-temperature phase (activation) are numerous:

[0048] 1. The continuously working rotary tube for pre-carbonization can be made of particularly acid-proof types of steel, which are less suitable for high temperatures, whereas the discontinuously working rotary tube (re-carbonization and activation) can be made of steel that is especially suitable for high temperatures. In other words, separation of the comparatively fast, corrosive stage, under the release of a great amount of SO<sub>2</sub> (pre-carbonization), from the comparatively slow activation enables an optimal adaptation of the equipment being used. Since, for example, pre-carbonization in the presence of acid may only require approx. 60 to approx. 120 minutes, whereas the activation, however, takes several hours, the rotary tube for pre-carbonization may have smaller dimensions than the rotary tube for re-carbonization/activation (The long duration in the large rotary tube for the activation is also the reason why it is not operated on a continuously working basis because the required length thereof would be enormous.).

Examples 1 and 2 describe a process in which an acidified polymer was fed into a rotary tube where it was heated to a first temperature; the pre-carbonized material was collected in an intermediate vessel or container and subsequently introduced into a discontinuously working

rotary tube with heating to a second higher temperature to activate the pre-carbonized material. The non-continuous process required two separate rotary tubes having different designs and an intermediate vessel to collect and hold the initially pre-carbonized particles.

Teaching of Angelo II

US 4,273,619 A (Angelo II) describes an apparatus for continuously carbonizing and activating carbonaceous materials (abstract). Angelo II does not refer to a complete carbonization operation in the sense of the von Blucher process or the presently claimed process, because Angelo II is completely silent with respect to the sulfonation of the starting material. Thus, Angelo II does not teach a method for completely carbonizing a material beginning with the sulfonation of a starting material and ending with a specific activation — in one single apparatus. Furthermore, the apparatus of Angelo II differs from the present invention by the fact that it does not provide any strict differentiation of the sectors. For example, Angelo II is completely silent regarding the use of specific locks to divide the apparatus into different well-defined sectors. The lack of a distinct separation of the sectors in Angelo II becomes clear from the examination of Fig. 2 which shows that the different gases are forced, at least in part, to flow through the carbonization material resulting in a mixing of the gases introduced. Because Angelo II fails to teach a process carried out in an apparatus having distinct sectors as suggested in the Office Action, Angelo II is not relevant to the present claimed invention.

A prima facie case of obviousness was not established

The combination of von Blucher and Angelo II fails to support a prima facie case of obviousness because: (a) von Blucher specifically teaches away from making the proposed combination; (b) the proposed combination would change the basic principle of operation for von Blucher's method (MPEP 2143.01, part VI); and (c) the combination would render the prior art von Blucher method unsatisfactory for its intended purpose (MPEP 2143.01, part V).

(a) Von Blucher teaches away from the proposed combination

In contrast to the present invention, von Blucher et al. performs the process for producing spherical activated carbon in two different apparatuses, namely in a continuously working rotary tube for pre-carbonization and a discontinuously working rotary tube for re-carbonization and activation, respectively. The two apparatuses are separated by an intermediate collection vessel. As noted in paragraphs 0047-0048, two different apparatuses are used in order to separate the acidic phase (pre-carbonization) from the high-temperature phase (activation). The use of

separate apparatuses for these distinct steps allows the material of construction and scale for each apparatus to be optimized. For example, the continuously working rotary tube used in the pre-carbonization step can be made of acid-proof types of steel whereas the discontinuously working rotary tube utilized for the activation step can be made of steel that is especially suitable for the required high temperatures.

Because von Blucher clearly requires a two-step process utilizing two differently designed apparatuses, it teaches away from the combination of von Blucher and Angelo II and away from applicant's claimed process carried out continuously in a single apparatus having divisions defining distinct sectors.

(b) The proposed combination would change the basic principle of operation for von Blucher's method and require substantial reconstruction and redesign of process equipment

According to MPEP 2143.01, part VI:

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (Claims were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. Patentee taught the device rigidity for operation, whereas the claimed invention required resiliency. The court reversed the rejection holding the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." 270 F.2d at 813, 123 USPQ at 352.).

As noted above, the von Blucher et al. method involves a discontinuous process that separates the acidic phase from the high temperature phase and is not a continuous process. Von Blucher notes the "...advantages of separating the acidic phase (pre-carbonization) from the high-temperature phase (activation) are numerous..." The advantages listed include the ability to employ optimum materials of construction for each element of the process equipment and the ability to gain optimal use of the equipment. The combination of Angelo II and von Blucher suggested by the Examiner would result in a continuous process carried out in a single apparatus that would change the basic principle of operation for von Blucher's method and require its

substantial reconstruction and redesign of process equipment to regain the advantages lost. For example, the entire apparatus would have to be constructed of materials capable of withstanding high temperatures in the presence of acids and through-put would be limited by the rate at which the activation step can be carried out making the initial portion of the apparatus oversized and having excess unusable capacity. Such a combination would change the basic principle under which the von Blucher method was designed to operate.

(c) The proposed modification would render the prior art von Blucher unsatisfactory for its intended purpose:

According to MPEP 2143.01, part V:

If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed Cir. 1984)

As noted above, the von Blucher method was designed to be carried out as a discontinuous process. A process based on the von Blucher reference in view of Angelo II would presumably be a continuous process carried out in a single apparatus. Because such a process would be unsatisfactory for its intended purpose of being carried out in equipment designed from optimal materials of construction and providing optimal use of the equipment, there is no suggestion or motivation to make the proposed modification.

2) Claims 22-24 and 36-37 were rejected under 35 U.S.C. §103(a) as being unpatentable over US Patent Publication No. 2003/0092560 by von Blucher in view of US Patent No. 4,273,619 by Angelo II, as applied to claims 18-19, 21, 25, and 27-35 above, and further in view of US Patent No. 5,212,144 by Schwartz, Jr.

For the above reasons, the combination of von Blucher et al. in view of Angelo II fails to support a prima facie case of obviousness. For the reasons provided below the combination of von Blucher et al. and Schwartz, Jr. similarly fails to support a prima facie case of obviousness.

U.S. Patent No. 5,212,144 (Schwartz) describes a process for making chemically activated carbon starting from a carbonaceous raw material. The carbonaceous starting material is impregnated with a chemical activating agent (abstract) and subjected to an activation process. In addition, the Schwartz method utilizes an activation process that differs from von Blucher,

Angelo II, and the presently claimed invention. Schwartz, Jr. teaches a chemical activation method wherein oxidizing agents are incorporated into the starting carbonaceous material prior to activation. In the Schwartz process, the oxidation is induced by the incorporated oxidizing agent and not by an oxidizing atmosphere as used with respect to the activation step of the present invention.

In this context, Schwartz only uses a sweep gas in the apparatus which is however, completely inert with respect to the material to be carbonized and activated, respectively. The sweep gas only serves to remove water and acid produced by the activation reaction (column 1, lines 61 to 63). Throughout the Schwartz process, a substantially homogeneous atmosphere is introduced.

Thus, on the whole, Schwartz is silent with respect to a specifically differentiated atmosphere within the apparatus in the sense of the present invention according to which a very inhomogeneous distribution of gases, namely inert gases, on the one hand, and activating reaction gases, on the other hand, is performed in addition to a specific dividing of the apparatus into distinct temperature zones. On the whole, Schwartz is not pertinent with respect to the present invention.

Because the Schwartz, Jr. method is similarly a continuous method, its combination with the von Blucher reference would change the basic principle under which the von Blucher method was designed to operate and would render the von Blucher method unsatisfactory for its intended purpose of being carried out in equipment designed from optimal materials of construction and providing optimal use of the equipment. As a result, there is no motivation to make the proposed modifications.

3) Claim 20 was rejected under 35 U.S.C. §103(a) as being unpatentable over US Patent Publication No. 2003/0092560 by von Blucher in view of US Patent No. 4,273,619 by Angelo II, as applied to claims 18-19, 21, 25, and 27-35 above, and further in view of US Patent No. 5,437,237 by Digre.

U.S. Patent No. 5,437,237 (Digre) refers to a continuous pyrolysis system designed to recover useful materials and energy from waste in an environmentally satisfactory manner. Thus, Digre does not refer to a specific process for producing activated carbon. Furthermore, the pyrolysis is performed in a substantially anaerobic environment. Only a homogeneous atmosphere in the sense of an inert atmosphere is used. Digre's teaching is unrelated to a process

having a differentiated atmosphere also comprising a section with activating gases as provided by the present invention in order to perform sulfonation, carbonization and activation within one and the same apparatus. Digre is completely silent with respect to Applicant's inventive concept and would therefore never be considered by the skilled practitioner.

Further, Digre teaches a continuous process that would change the basic principle under which the von Blucher method was designed to operate and would render the von Blucher method unsatisfactory for its intended purpose of being carried out in equipment designed from optimal materials of construction and providing optimal use of the equipment. As a result, there is no motivation to make the proposed modifications.

4) Claim 26 was rejected under 35 U.S.C. §103(a) as being unpatentable over US Patent Publication No. 2003/0092560 by von Blucher in view of US Patent No. 4,273,619 by Angelo II, as applied to claims 18-19, 21, 25, and 27-35 above, and further in view of US Patent No. 6,316,378 by Giebelhausen et al.

U.S. Patent No. 6,316,378 B1 (Giebelhausen et al.) describes a process for the production of shaped activated carbon by steam activation in a continuously operating rotary tunnel kiln, subdivided into a carbonizing zone and an activating zone (abstract). However, Giebelhausen et al. are completely silent with respect to sulfonation of the shape activated carbon being performed in the same apparatus. In fact, the raw materials are treated in a dryer (a separate rotary tunnel kiln) and are only afterwards transferred to a second indirectly heated rotary tunnel kiln to be continuously processed as delineated in Claim 1. Therefore, Giebelhausen et al. have nothing in common with the present invention.

In addition, because Giebelhausen teaches a continuous process that would change the basic principle under which the von Blucher method was designed to operate and would render the von Blucher method unsatisfactory for its intended purpose of being carried out in equipment designed from optimal materials of construction and providing optimal use of the equipment. As a result, there is no motivation to make the proposed modifications.

## Summary

Applicant's claimed invention involves conducting an entire carbonization operation, with its various process steps or sectors. The process is carried out in a single apparatus having a plurality of temperature zones or a temperature gradient across the apparatus for this purpose.

This makes it possible to perform the carbonization operation continuously, i.e. without any interruption, in particular without the apparatus being changed, which allows a significant simplification and efficiency enhancement of the process operation, associated with economic savings.

On the whole, the claimed subject-matter on the basis of the pending amended claims is inventive over the prior art documents because none of the prior art documents, alone or in combination, anticipates or even suggests a combination of the inventive features of amended independent Claims 18, 36 and 37, respectively. The von Blucher et al. reference is a particularly inappropriate reference to base the various rejections upon because the process taught is a discontinuous process requiring the separation of the respective process steps in different apparatuses having different material specifications. Because each of the references coupled with von Blucher et al. to support the various rejections involve continuous processes, their coupling with von Blucher destroys the cited advantages of von Blucher's discontinuous method, none of the combinations support a prima facie case of obviousness under 35 U.S.C. §103(a), and the claimed invention is in fact unobvious.

Accordingly, the claims that are now presented, as amended, are believed to be in condition for allowance and favorable action by the Examiner is respectfully requested. Should the Examiner have any questions about this submission or should there be other matters which might be readily resolved, the Examiner is invited to telephone the undersigned attorney.

Respectfully submitted,

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